2017-3

Augmented Reality, Virtual Reality, & Health

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Et al.

Augmented Reality, Virtual Reality, & Health

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Outline

- Introduction & Overview
- Augmented Reality & Health
  Virtual Reality & Health
- Technology Funding Opportunities
- University of New England
  VR Project

Learning Objectives

Objectives:

- Explore AR & VR technologies and their impact on health sciences, with examples of projects & research
- Know how to apply for funding for your own AR/VR health project
- Learn about one VR project funded by the NNLM

Augmented Reality and Virtual Reality (AR/VR) & Health

What is AR and VR?

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What is Augmented Reality?

- The combination of a real world scene that is augmented by a virtual overlay generated by a computer program that adds additional information to the scene.

- Real world + virtual layer

One, M. (2010, January). MedicalAR [Digital image]. Retrieved February, 2017, from http://technoccult.net/archives/2010/01/11/augmented-reality-medical-app/

How does AR work?

- Pick a real world scene
- Add virtual computer generated objects in real time by either substituting CG components for all real-world objects of interest within the scene or just adding CG components at certain markers within the scene.
- In this scene the card on the table is a marker telling the AR program where in the scene to display the heart animation

ARworks. (n.d.). ARBody-59 [Digital image]. Retrieved February, 2017, from http://www.arworks.com/en/portfolio-item/medical-ar-proof-of-concept/

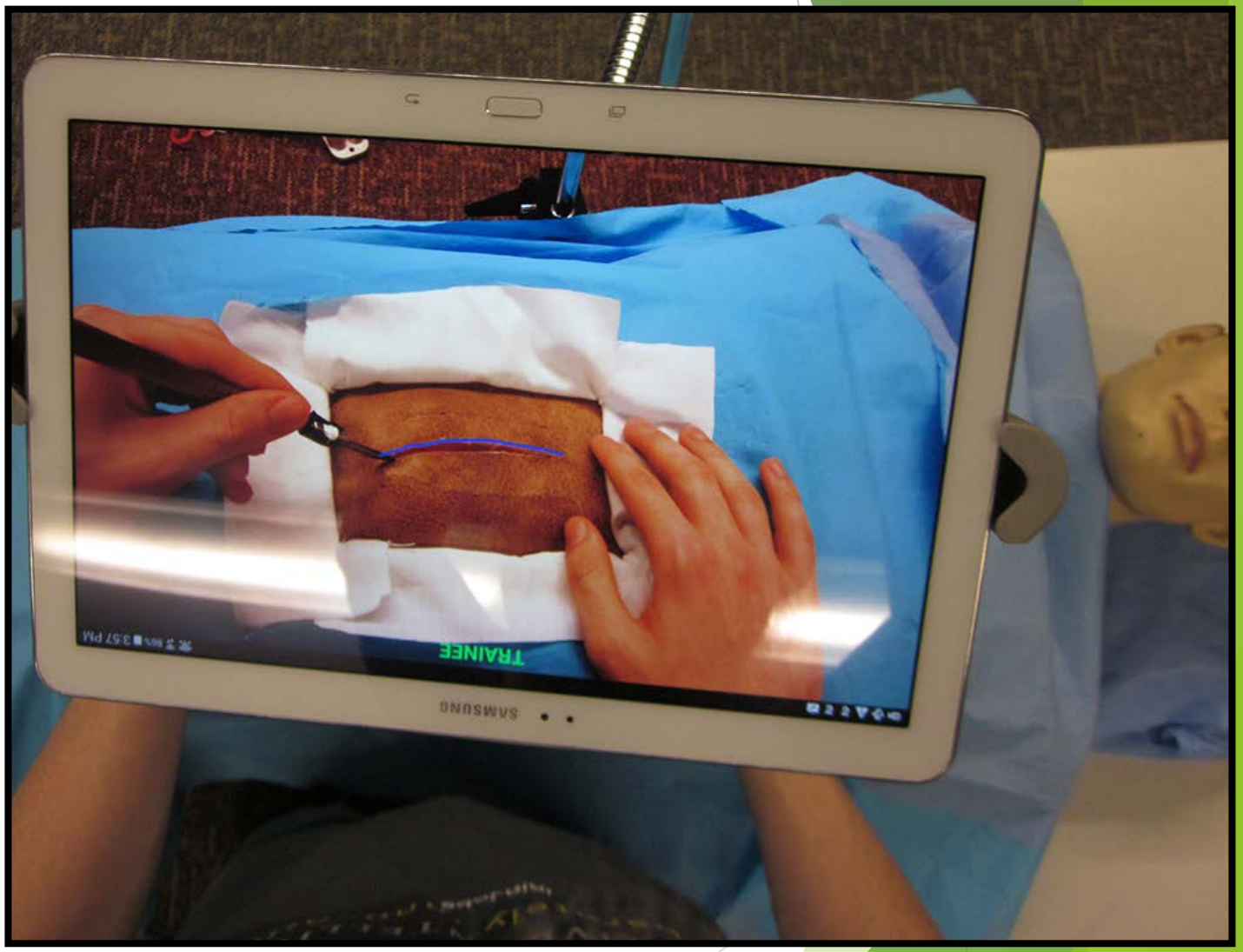
How does AR work?

- Using the AR device's camera view, the AR program then tracks the real world objects/markers using the user's movement and interactions with the scene and updates the status of all cg objects accordingly
- As the tablet moves the camera view of the marker on the mans chest will change and the lung animation will reposition on the screen accordingly.

LearnMoreAdmin. (2013, November). TJO9830 [Digital image]. Retrieved February, 2017, from http://learnmoreapp.com/news/what-is-augmented-reality

How does AR Work

- AR is a subset of VR but is not full virtual reality since the environment is real
- AR is usually displayed though a mobile video screen attached to a laptop, tablet, cell phone, projector, or head mounted display
  (Basically any device with a video feed and a display screen that can be augmented)



Wade, A. (2015, August). Wachs-star [Digital image]. Retrieved February, 2017, from https://www.theengineer.co.uk/issues/august-2015-digi-issue/augmented-reality-for-remote-surgery-mentoring/

What is virtual reality

Virtual reality is a real-time simulation where the user is effectively immersed in a responsive virtual world that provides visual and audio (and sometimes other) sensory inputs that make the virtual world seem real. And makes the user feel present in the simulation.

- Virtual world + real inputs

Xin, X. (2014, September). XinXin-DesigningForVirtualReality-Polyworld-498x300 [Digital image]. Retrieved February, 2017, from http://www.hypergridbusiness.com/2014/09/5-tips-for-designing-for-virtual-reality/

Virtual reality Devices

- HMDs (head mounted displays)

Google Cardboard

Santos, M. (2016, April). The-hannover-messe-is-the-biggest-industrial-trade-fair-in-the-worldwith-lots-of-high-tech-gadgetry-on-display [Digital image]. Retrieved February, 2017, from https://futurism.com/president-obama-gets-enters-virtual-reality/

Oculus Rift

CBS news. (2015, May). Ctm05043d-brain-imaging387669640x360 [Digital image]. Retrieved February, 2017, from http://www.cbsnews.com/news/virtual-reality-headsets-for-neurosurgeons-ucla-dr-neil-martin-moty-avisar/

HTC vive

Hutchinson, L. (2016, January). HTC-Vive_White-640x400 [Digital image]. Retrieved February, 2017, from https://arstechnica.com/gaming/2016/01/htc-says-vive-preorders-to-start-on-february-29-with-shipping-in-april/

VR input devices

- Natural motion input controllers (motion trackers)

Gilbert, B. (2016, March). Oculustouchwitharrows [Digital image]. Retrieved February, 2017, from http://www.businessinsider.com/oculus-rift-review-2016-3

Lang, B. (2016, February). Oculus-rift-htc-vive-motion-controllers2 [Digital image]. Retrieved February, 2017, from oculus-rift-htc-vive-motion-controllers2

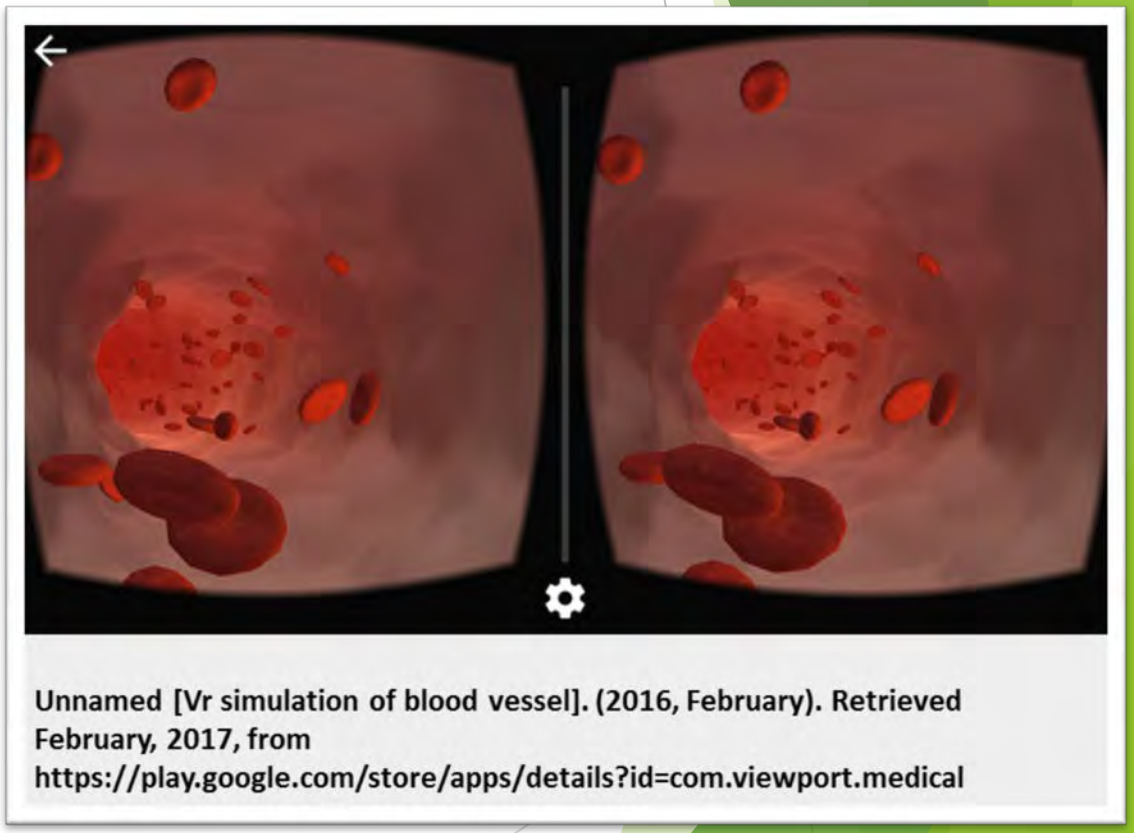
Other Advanced VR input devices

- Directional sound, tactile and force feedback devices (Sensory gloves), create a more sensualized interface.
- Haptic (touch) interfaces and tactile feedback devices such as the cybergrasp glove allow you to ‘feel’ the 3d world

Cyberglove Systems. (2015). [Cybergrasp glove]. Retrieved February, 2017, from http://www.cyberglovesystems.com/cybergrasp/#photos

How does VR work? Video

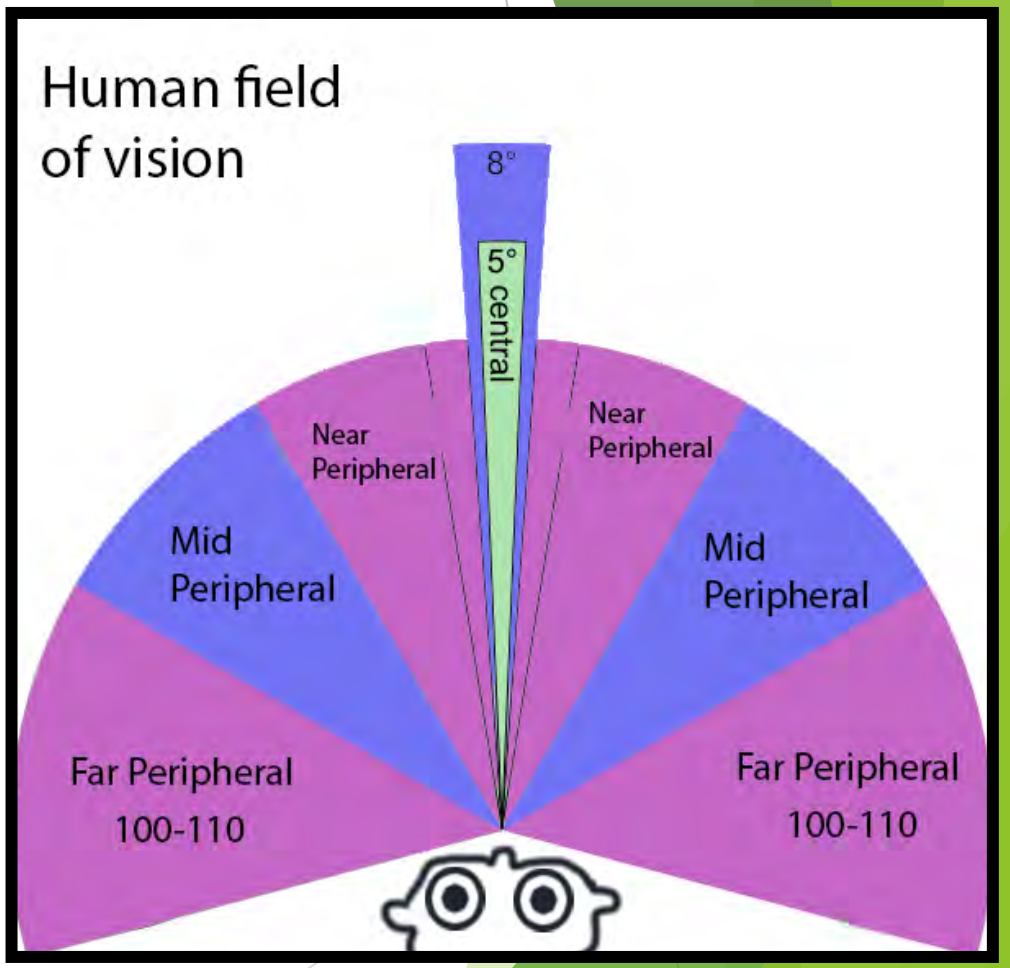
- One way VR tricks your brain into thinking what you are seeing is a 3d world is with a **stereoscopic display**. This works by displaying two slightly different angles of the scene to each eye, simulating depth.
- **Parallax** is also used to simulate depth (farther objects to you seem to move slower)



Unnamed [Vr simulation of blood vessel]. (2016, February). Retrieved February, 2017, from https://play.google.com/store/apps/details?id=com.viewport.medical

How does VR work? Video

- **Field of view** is a radius around you that you can see at any given time. For example, humans have about a 180 degree FOV while looking straight ahead, and 270 degrees with eye movement.
- The higher FOV a VR system provides the realer it seems.



How does VR work? Video

- **Latency** is also a major factor that goes into a pleasant VR experience, with anything over 20 milliseconds not being fast enough to trick your brain into thinking you are in a different world. Depending on the system your VR screens will have an average latency, around 4-5 ms. Many system factors can increase latency.

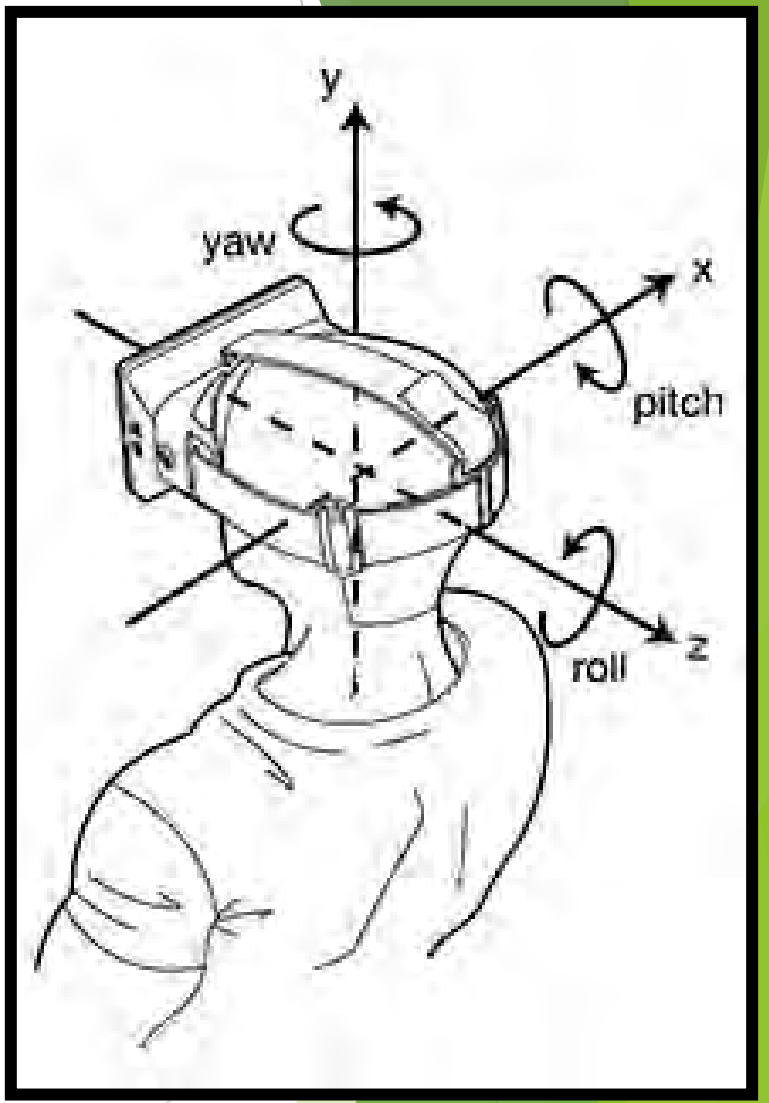
"Not meeting an acceptable frame rate, FOV or latency can cause **motion sickness**."(Mullis)

How does VR work? Movement

How does the system know how to move us around in the virtual world?

- **accelerometers, gyroscopes** and **magnetometers** are used to achieve movement of the user in the virtual world.

- The **accelerometer** is used to detect three dimensional movement
- The **gyroscope** is used used to detect angular movement
- The **magnetometer** detects our position relative to the Earth.



Oculus VR. (2013, January). Headset_fig8 [Digital image]. Retrieved February, 2017, from https://www3.oculus.com/en-us/blog/building-a-sensor-for-low-latency-vr/

How does VR work? Audio

Spatial audio (3D audio)

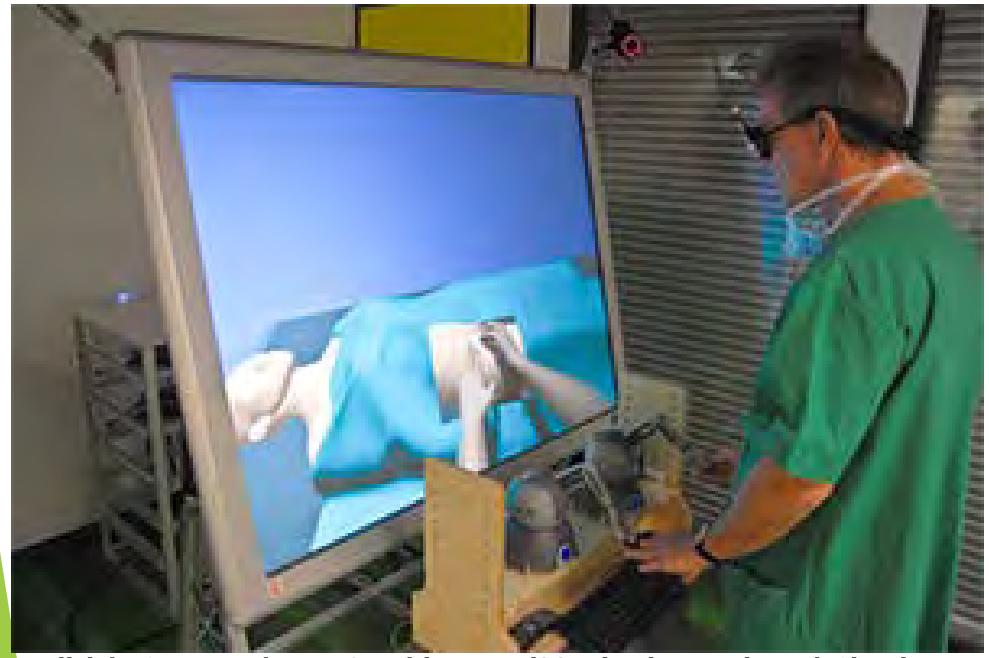
- This system is in charge of the virtual placement of sound in a three dimensional environment. The system generates sounds from different angles to simulate sound coming from different directions.

Am3d. (n.d.). 3d_300x287 [Representation of 3d sound system]. Retrieved February, 2017, from http://www.am3d.com/home-english/products/zirene%C2%AE-3d.aspx

Other Kinds of VR

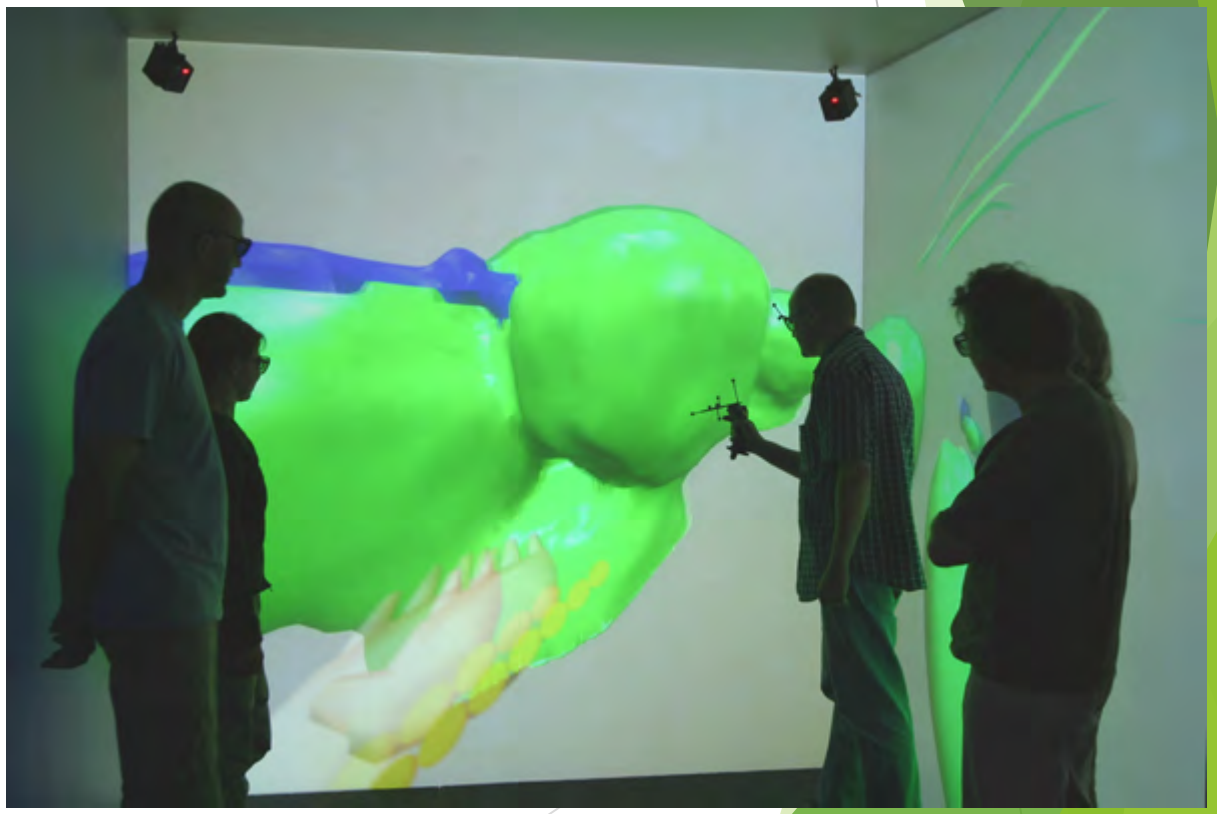
Semi-Immersive Projection Systems

- Large high resolution screens or projections give a sense of scale with 3d glasses giving depth



Ullrich, S., Rausch, D., & Kuhlen, W. (2011). BimanualHapticSimulator [Digital image]. Retrieved February, 2017, from http://diglib.eg.org/handle/10.2312/EGVE.JVRC11.039-046

- Allows simultaneous experience of the VE which is not available with head-mounted immersive systems



Schoor, W., Bollenbeck, F., Seidl, T., Weier, D., Weschke, W., Preim, B., . . . Mecke, R. (2009). Figure01 [Digital image]. Retrieved February, 2017, from https://www.jvrb.org/past-issues/6.2009/2257

Augmented Reality vs. Virtual reality

Augmented Reality

- System augments a real world scene
- User maintains a sense of presence in the real world
- Needs a mechanism to combine virtual and real worlds

Virtual reality

- Totally immersive virtual environment
- Visual and Auditory senses are under control of system (sometimes tactile and proprioceptive senses also)
- Need a mechanism to feed virtual world to user

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- **Mullis, A. (2016, July 15). How does virtual reality work? Retrieved February 26, 2017, from http://www.androidauthority.com/virtual-reality-work-702049/**

Augmented Reality and Health
Exploring the Technology

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Texas Tech Health Sciences Center El Paso

Disclosure

- I am not an expert in programming or with augmented reality (AR)

- I am currently a Learning Technology graduate student in the University of North Texas online degree program

- As a librarian I find this technology interesting as a learning modality in the health field

- This segment is for anyone interested in this technology

Augmented reality (AR,)" is computer-generated content overlaid on a real world environment. AR hardware comes in many forms, including devices that you can carry, such as handheld displays, and devices you wear, such as headsets, and glasses. Common applications of AR technology include video games, television, and personal navigation, though there are many other uses as well."

- Christensson, Per

Why is augmented reality important?

- Staying knowledgeable on upcoming technology is an important core competency
- Librarians are usually the trend setters of technology
- Augmented reality offers access to new learning modalities
- Hosting new emerging technologies is a way for libraries to promote a stronger engagement with their users

- A simple search in PubMed, CINAHL and searched for augmented reality and medical education; came up with approximately 578 results

- Technologies being used in medical education

- AR health apps which are available for consumers

- Websites that provide open source software for creating AR

- First I would like to go over the brief history of AR

History Timeline

1968

Ivan Sutherland created the first head mounted display system

1974

Myron Kruger built an artificial reality lab.

1990

Tom Caudell coins the term augmented reality

1994

Julie Martin creates first AR theater production " Dancing in Cyberspace"

1998

Sports Vison broadcast the first virtual 1st & 10 line on a football field

1999

Naval researchers use a Battlefield AR training

History Timeline …

2000
Hirokazu Kato created the ARToolkit. This is an open source library . Sources use video tracking, computer graphics and a camera.

2009
ARToolkit brings AR to web browsers

2013
AR us used for auto repair by car manufacture Volkswagen. MARTA provided a step by step guide repair assistance.

2014
Goggle Glass is available to consumers. The beginning of wearable AR

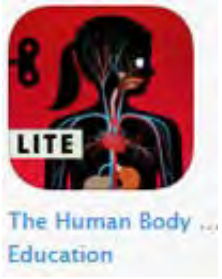
2014
Magic Leap invests $50M in AR

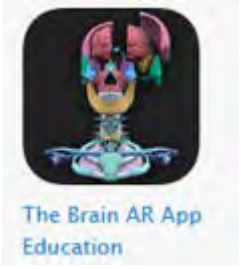
2015
Investment reaches $700 million for AR and VR

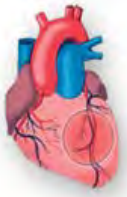
2016
Microsoft Hololens developer kit and Meta 2 Developer Kit available

Augmented reality has open the door for apps within the medical field. These are some examples of the apps available for consumers. These apps are free for download

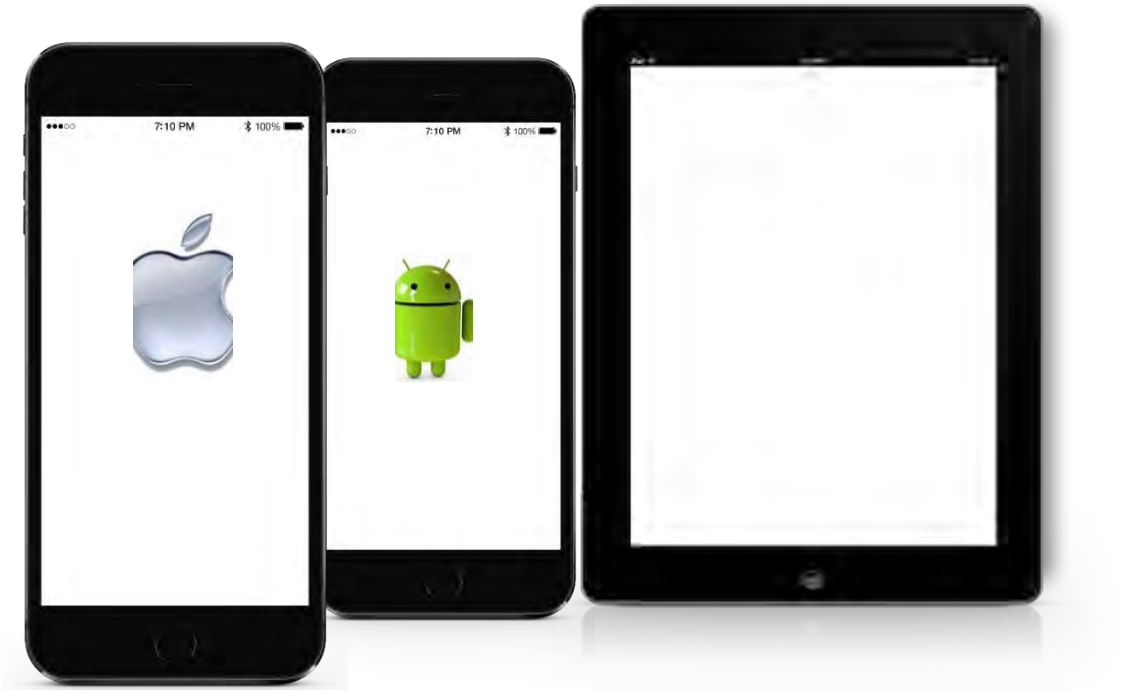
Anatomy 4D







Let's Check out some apps

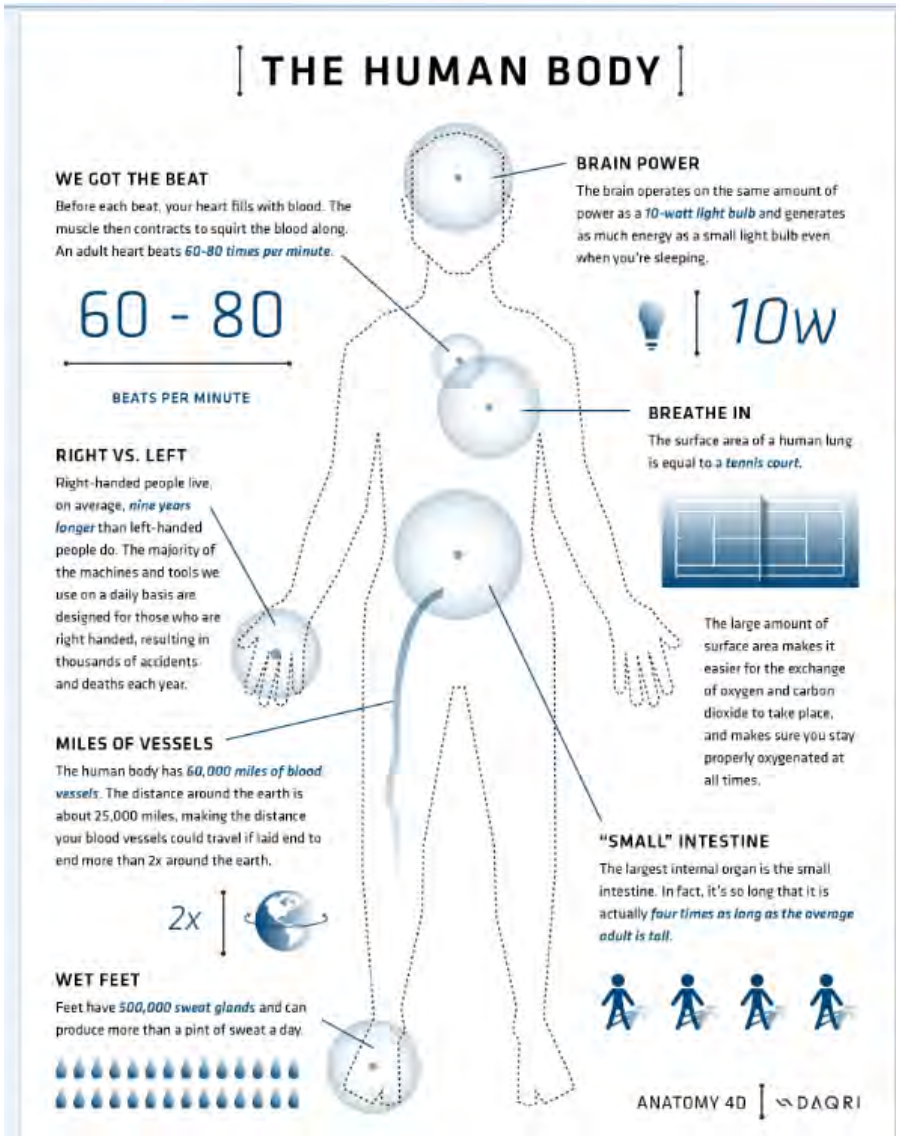


Download Anatomy 4D and Easy Heart on your smartphones, IPad or tablets

Search for Anatomy 4D and Easy Heart in Google Play or the App Store

Once you have downloaded the Apps open the Anatomy 4D app first . Position the device's camera on the next screen.

THE HUMAN BODY



WE GOT THE BEAT

Before each beat, your heart fills with blood. The muscle then contracts to squirt the blood along. An adult heart beats ***60-80 times per minute***.

60 - 80

BEATS PER MINUTE

BRAIN POWER

The brain operates on the same amount of power as a ***10-watt light bulb*** and generates as much energy as a small light bulb even when you're sleeping.

10w

BREATHE IN

The surface area of a human lung is equal to a ***tennis court***.

The large amount of surface area makes it easier for the exchange of oxygen and carbon dioxide to take place, and makes sure you stay properly oxygenated at all times.

RIGHT VS. LEFT

Right-handed people live, on average, ***nine years longer*** than left-handed people do. The majority of the machines and tools we use on a daily basis are designed for those who are right handed, resulting in thousands of accidents and deaths each year.

MILES OF VESSELS

The human body has ***60,000 miles of blood vessels***. The distance around the earth is about 25,000 miles, making the distance your blood vessels could travel if laid end to end more than 2x around the earth.

2x

"SMALL" INTESTINE

The largest internal organ is the small intestine. In fact, it's so long that it is actually ***four times as long as the average adult is tall***.

WET FEET

Feet have ***500,000 sweat glands*** and can produce more than a pint of sweat a day.

ANATOMY 4D | DAQRI

THE HEART

ELECTRICALLY CHARGED

Because the heart has its own electrical impulse, it can continue to beat even when separated from the body, as long as it has an adequate supply of oxygen.

HOSE VS. HAIR

The aorta, the largest artery in the body, is almost the diameter of a garden hose. Capillaries, on the other hand, are so small that it takes ten of them to equal the thickness of a human hair.

PASS THE TISSUE

Blood is actually a tissue.

ENTRANCE HALL & LITTLE BELLY

"Atrium" is Latin for "entrance hall" and "ventricle" is Latin for "little belly."

HEART POWER

The volume of blood pumped by the heart can vary over a wide range, from five to 30 liters per minute.

HEART SPRINTS

Even at rest, the muscles of the heart work hard—twice as hard as the leg muscles of a person sprinting.

TRAVEL PRO

When the body is at rest, it takes only six seconds for the blood to go from the heart to the lungs and back, only eight seconds for it to go to the brain and back, and only 16 seconds for it to reach the toes and travel all the way back to the heart.

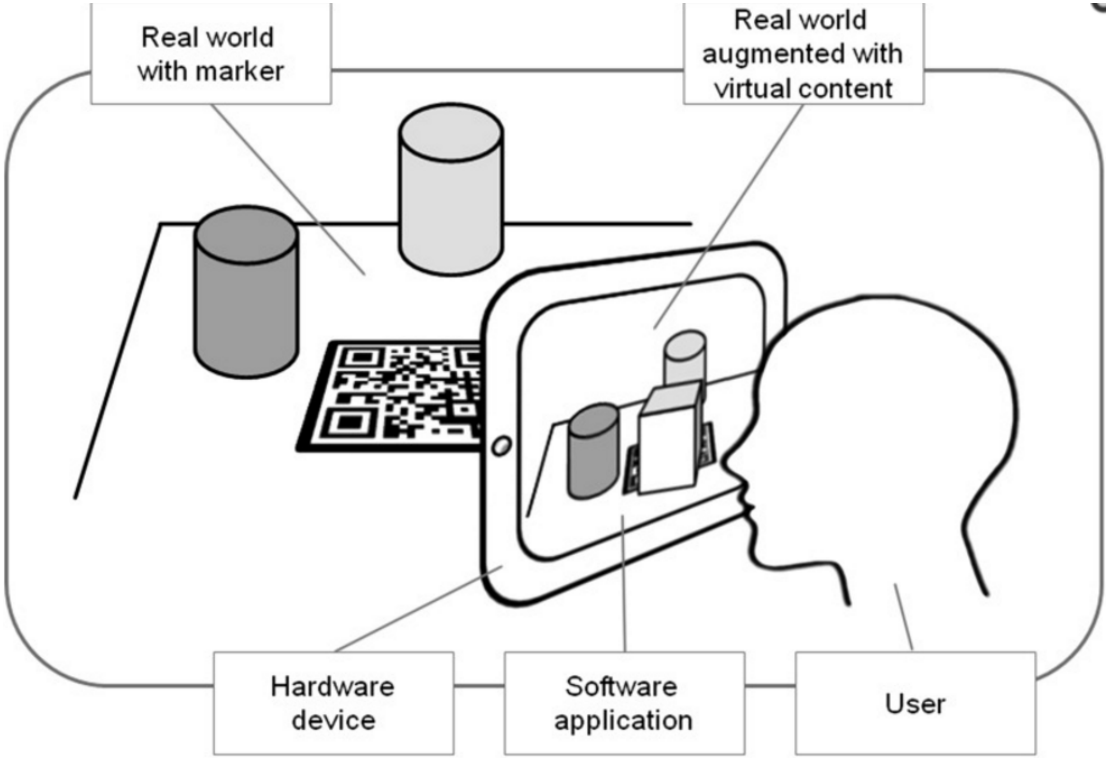
ANATOMY 4D | DAQRI

Okay close the Anatomy 4 app and let's try the Easy Heart App

Open the Easy Heart app and position device camera on the next picture

For Patients: This application is for patient education purposes only. It does not replace the advice or counsel of a doctor or health care professional.

How does AR work?



Perspect Med Educ. 2014 Sep; 3(4): 300–311.

In order to create augmented reality ; developer tools / software is required

Access ARToolkit at : http://artoolkit.org/

ARToolkit provides open source and proprietary sources

ARToolkit is the original C/C++ library for developing augmented reality (AR)

Depending on the source, it may require to have basic to advance knowledge of programming language Java or C/C++

Creating AR may consist of “training markers” or markerless AR with parallel tracking and mapping(PTAM)

PTAM defined as “is a camera tracking system for augmented reality. It requires no markers, pre-made maps, known templates, or inertial sensors” -

Some websites will help you create training markers

Training markers simply means setting the image to be recognized by the computer’s camera so that it can project the image in augmented reality.

Creating markerless AR will require more programming experience and research.

A few software tools for the development of AR

Name of software	What it does	URL	Notes
Parallel Tracking and Mapping (PTAM)	Implements real time vision algorithms in C++ on platform of choice	www.robots.ox.ac.uk/-gk/PTAM/	For experience software developers Free download
ARToolkit	Allows programmers to develop AR applications in cross-platforms	Artoolkit.org	Beginners to more advance developers Free download
Unity	Create 2D or 3D games	https://unitu3d.cim?unity	Beginner to advance Free download for personal use
Vuforia	Develops Apps	https://www.vuforia.com	Beginner to advance Works with Unity Free download for personal use
Envisage	Create 3D AR scences from own models, images and multimedia content	https://envisage.ar.com	Beginner (non-programmer)
SketchUp	Draw in 3D	https:www.sketchup.com	Works with envisage Trial (propriety source)
Designers Augmented Reality Toolkit (DART)	Design to facilitate the complete design and development process of AR	Ael.gatech.edu/dart	Any level of developers

Other AR used in health care field

- Accuvein- Hand held scanner allows health professionals to see a map of peripheral veins on patient

  Improves venipuncture and saves money

- Gunner Goggles- AR technology imaged on text
http://www.gunnergoggles.com/

- Hololens - https://caehealthcare.com/hololens

- Mirracle- Magic Mirror uses AR to overlay a volume visualization of a CT onto the user

- ProMIS- laparoscopic simulator uses AR

- VA-ST – Technology that can recognize 3D objects and identify them

Legally blind and partial blind patients can benefit

These are only a few of what is being developed.

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Virtual Reality & Health

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The University of Massachusetts Medical School

National Network of Libraries of Medicine, New England Region

National Public Health Coordination Office

University of Massachusetts Medical School

NIH NLM NNLM

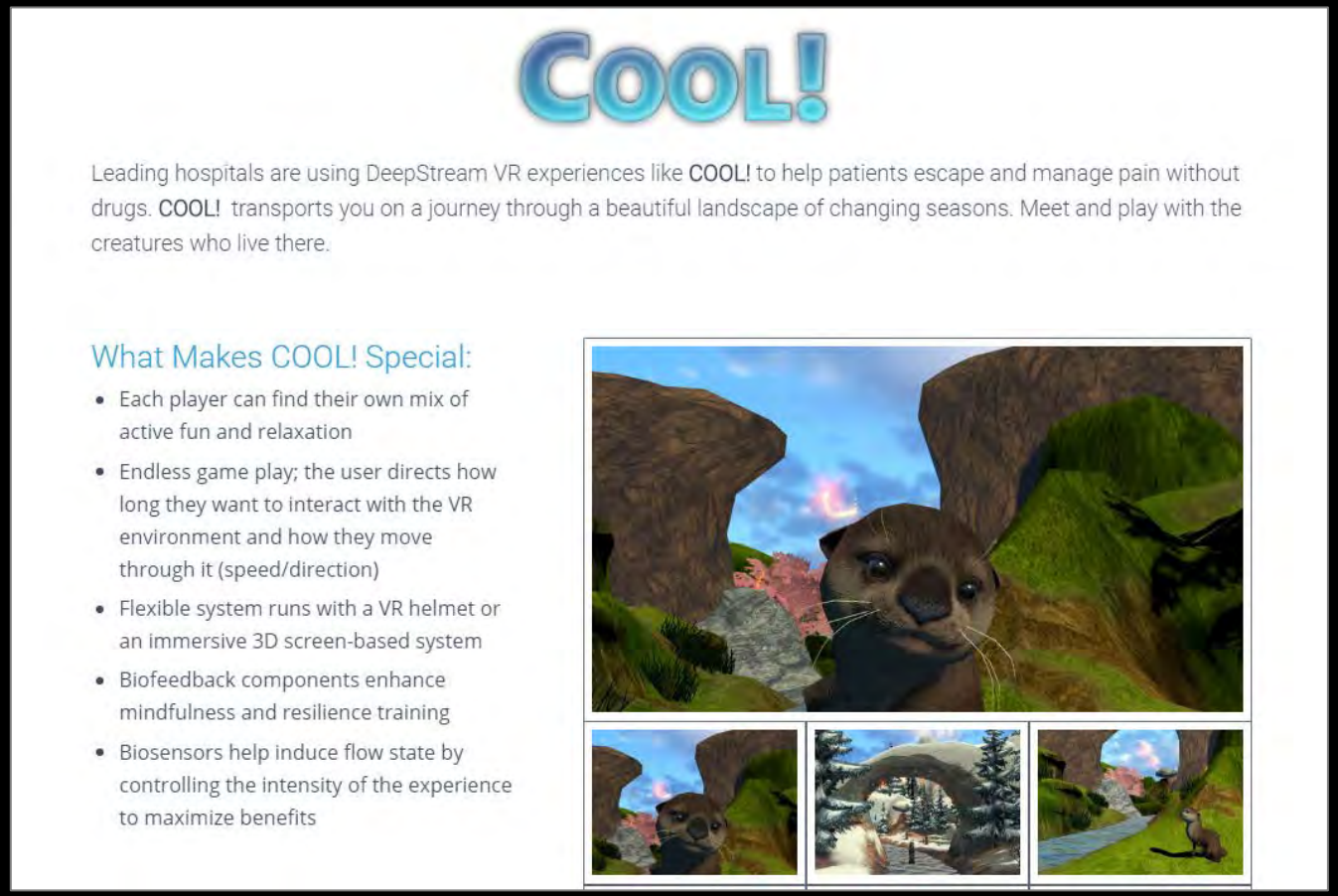
National Network of Libraries of Medicine

Terminology

Noteworthy phrases:

Virtual Reality
Augmented Reality
Mixed Reality
Digital Realities

Cool! – Pain Relief



- Highest pain **tolerance** levels occurred when visual and auditory sensory inputs were combined
- Sound or images on their own also boosted pain-tolerance levels
- SnowWorld (earlier Pain Relief VR experience) had 60% of patients experiencing a more than 30% reduction in pain
- Cool! Was created especially for clinical use with burn victims and wound care

Jones, T., Moore, T., & Choo, J. (2016). The Impact of Virtual Reality on Chronic Pain. *PloS one*, *11*(12), e0167523.
Johnson, S., & Coxon, M. (2016). Sound can enhance the analgesic effect of virtual reality. *Royal Society open science*, *3*(3), 150567.

Exposure Therapy & Phobias

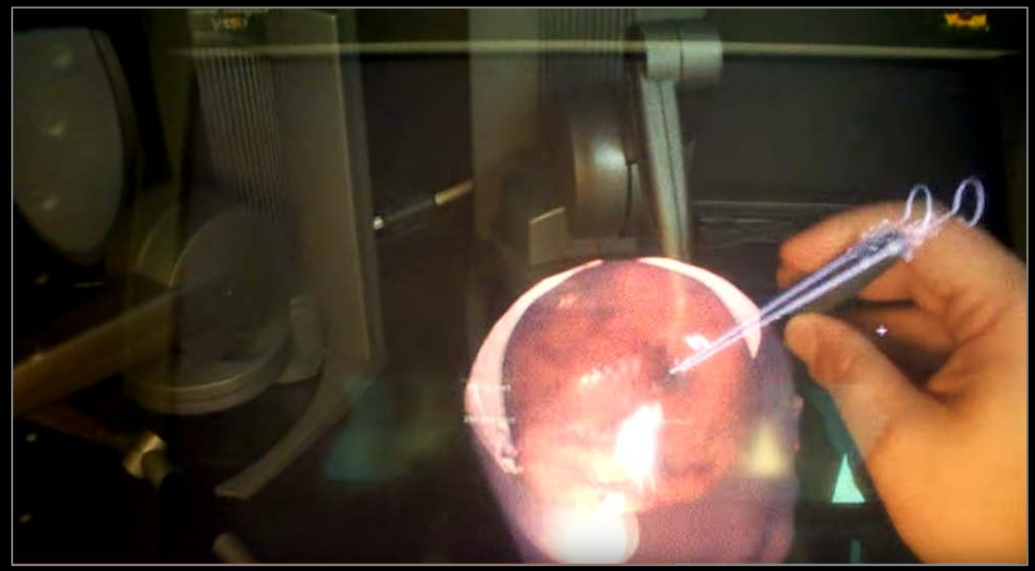
"SpiderWorld" and "Fearless" are two VR experiences to help people with encountering and conquering their phobias.

Exposure Therapy & Phobias

The creator of “Fearless” overcame his fear of spiders by spending hours in his virtual world.

Training Medical Professionals

The world's first surgery streamed in virtual reality with Dr. Shafi Ahmed and took about 3 hours.



Immersive Touch, education platform, virtual reality with haptic and tactile feedback

Gasco, J., Patel, A., Ortega-Barnett, J., Branch, D., Desai, S., Kuo, Y. F., ... & Banerjee, P. (2014). Virtual reality spine surgery simulation: an empirical study of its usefulness. *Neurological research*, *36*(11), 968-973.

MindMaze – Rehabilitation in Stroke

How Medical Needs Are Being Met

- Early start
- Objective markers
- Simulations of daily life
- Maximize practice time

VR Labs

Stanford University
Virtual Human Interaction Lab
https://vhil.stanford.edu/

USC Institute for Creative Technologies

University of Southern California
Institute for Creative Technologies
http://medvr.ict.usc.edu/

Funding Opportunities

Background of NNLM

U.S. Department of Health & Human Services (HSS)

National Institutes of Health

National Library of Medicine

National Network of Libraries of Medicine

The mission of the NNLM is to advance the progress of medicine and improve the public health by providing all U.S. health professionals with equal access to biomedical information and improving the public's access to information to enable them to make informed decisions about their health.

Funding Opportunities

Would you like to start a health-centered project with VR or AR, or other kinds of technologies?

You could apply for funding from NNLM.

NNLM.GOV/FUNDING

NNLM Regions

8

New England Region (NER)

NER proudly serves: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. The New England Region is based in Worcester, MA, at the University of Massachusetts Medical School.

NNLM NER Funding

Funding Opportunities

Title	Amount/Application Deadline	Description	Funding Period/Status
Community Engagement	up to $10,000 04/07/2017 (All day)	Support short-term outreach projects that involve advancing health information resources in collaboration with local community groups.	05/01/2017 to 04/30/2018 Open
Knowledge & Data Management	up to $10,000 04/07/2017 (All day)	Support projects that stimulate innovations in biomedical knowledge or data management and information or research services at the health care or research institution.	05/01/2017 to 04/30/2018 Open
Member Programs	up to $5,000 04/07/2017 (All day)	Support the development of instructional programs that improve the knowledge and skills of librarians and health information professionals.	05/01/2017 to 04/30/2018 Open
Technology	up to $7,000 04/07/2017 (All day)	Enhance technology access to and delivery of health information for Network Members, health professionals, and consumers.	05/01/2017 to 04/30/2018 Open

NNLM.GOV/NER/FUNDING

Currently 4 types of awards available from NER

New England Region (NER)

NER serves: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

NNLM NER Funding

NNLM NER Call for Applications

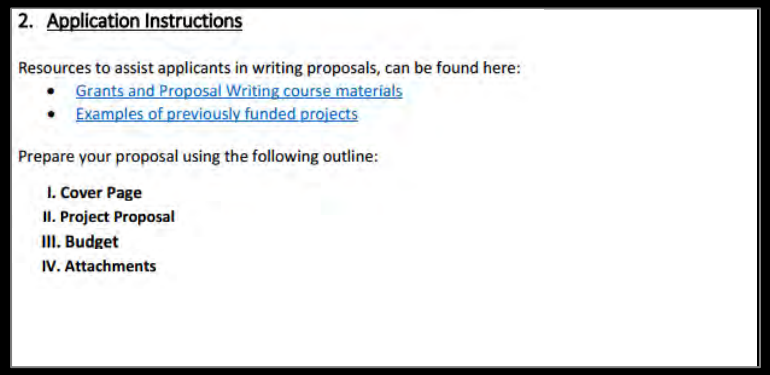
Funding Category	Summary	Maximum Funding per Award
Technology	Enhance technology access to and delivery of health information for Network Members, health professionals, and consumers.	$7,000

Period of Performance: May 1, 2017- April 30, 2018

1. Description of the Award

The National Network of Libraries of Medicine New England Region (NNLM NER), under cooperative agreement with the U.S. National Library of Medicine (NLM), announces the availability of funding through Technology Awards for projects to be conducted by network members and community groups in support of the NNLM mission to broaden access to health information.

NNLM Call for Applications 2017-2018



2. Application Instructions

Resources to assist applicants in writing proposals, can be found here:

- Grants and Proposal Writing course materials
- Examples of previously funded projects

Prepare your proposal using the following outline:

I. Cover Page
II. Project Proposal
III. Budget
IV. Attachments

Step by Step Instructions

Funding

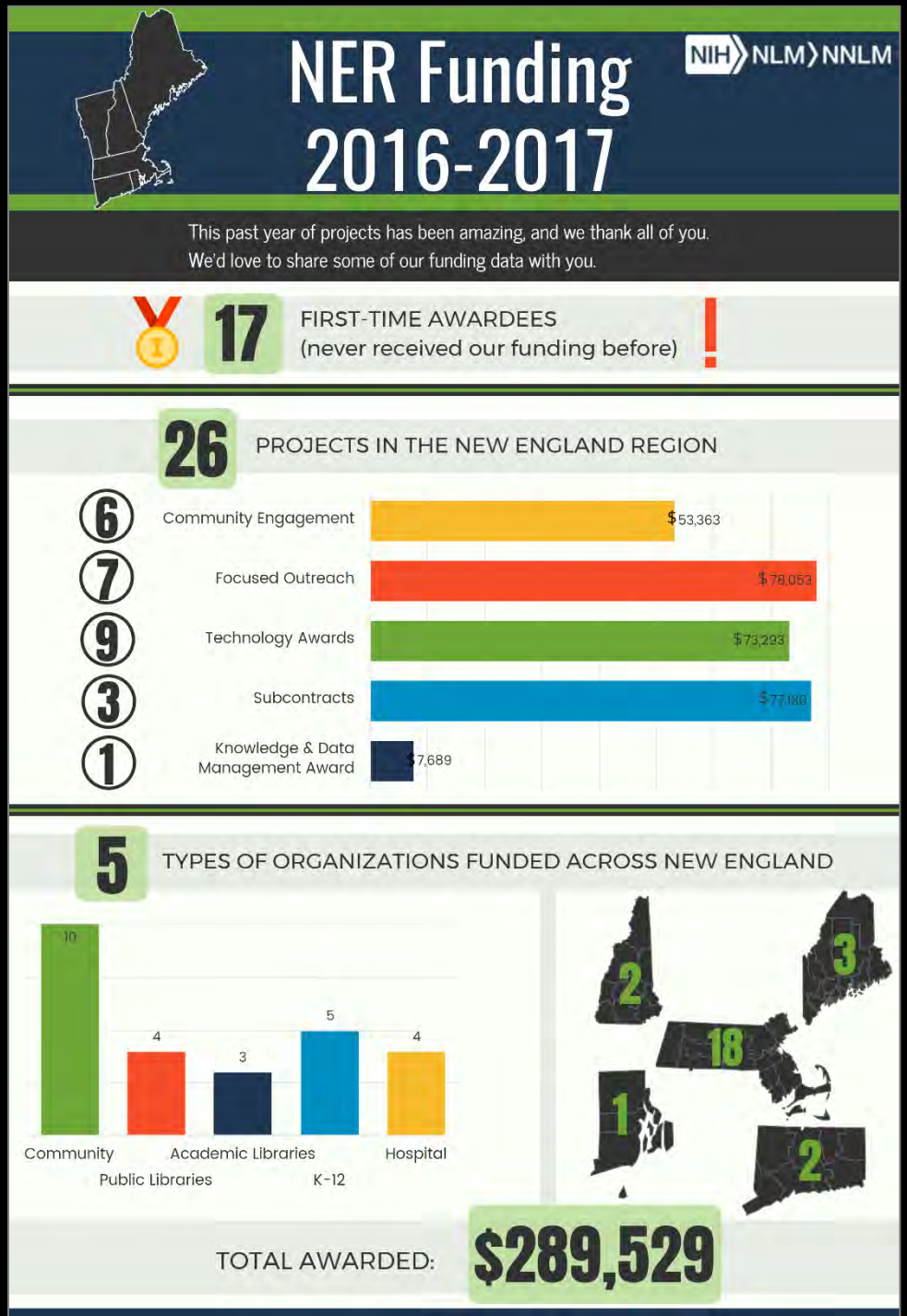
The National Network of Libraries of Medicine funds projects to advance the National Library of Medicine's mission to improve access to health information. Below is a list of funding categories for 2017-2018.

Individual Forms

Direct Beneficiaries Populations Targeted Forms
Exhibit Form
Goal Identification Form
Statement of Intent To Establish A Consortium Agreement

Easy to download and fill out PDFs

NNLM NER Funding



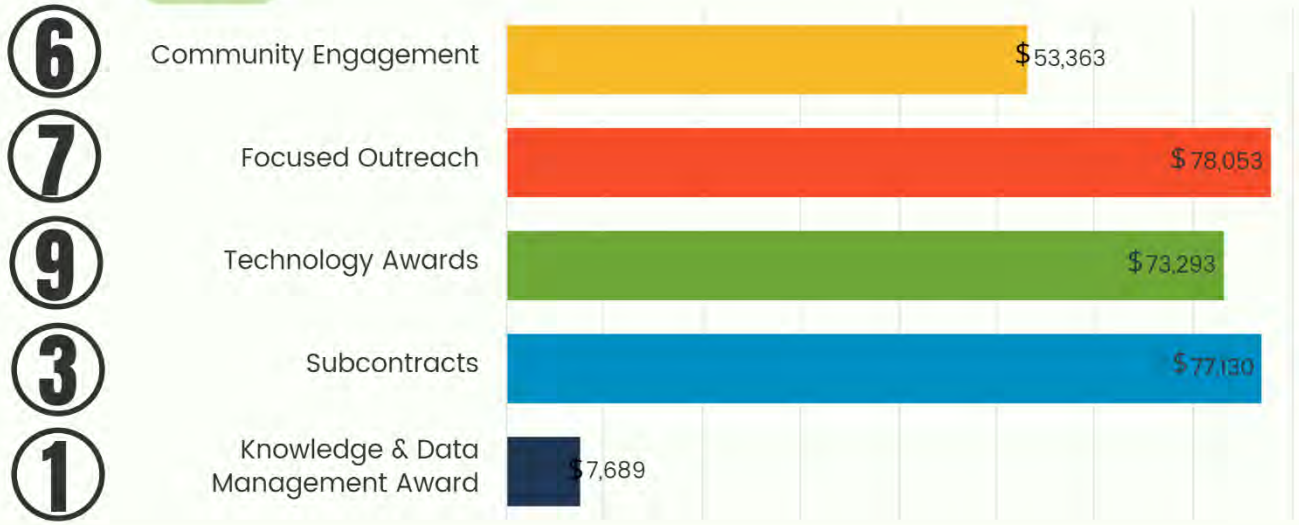
NER Funding 2016-2017

NIH NLM NNLM

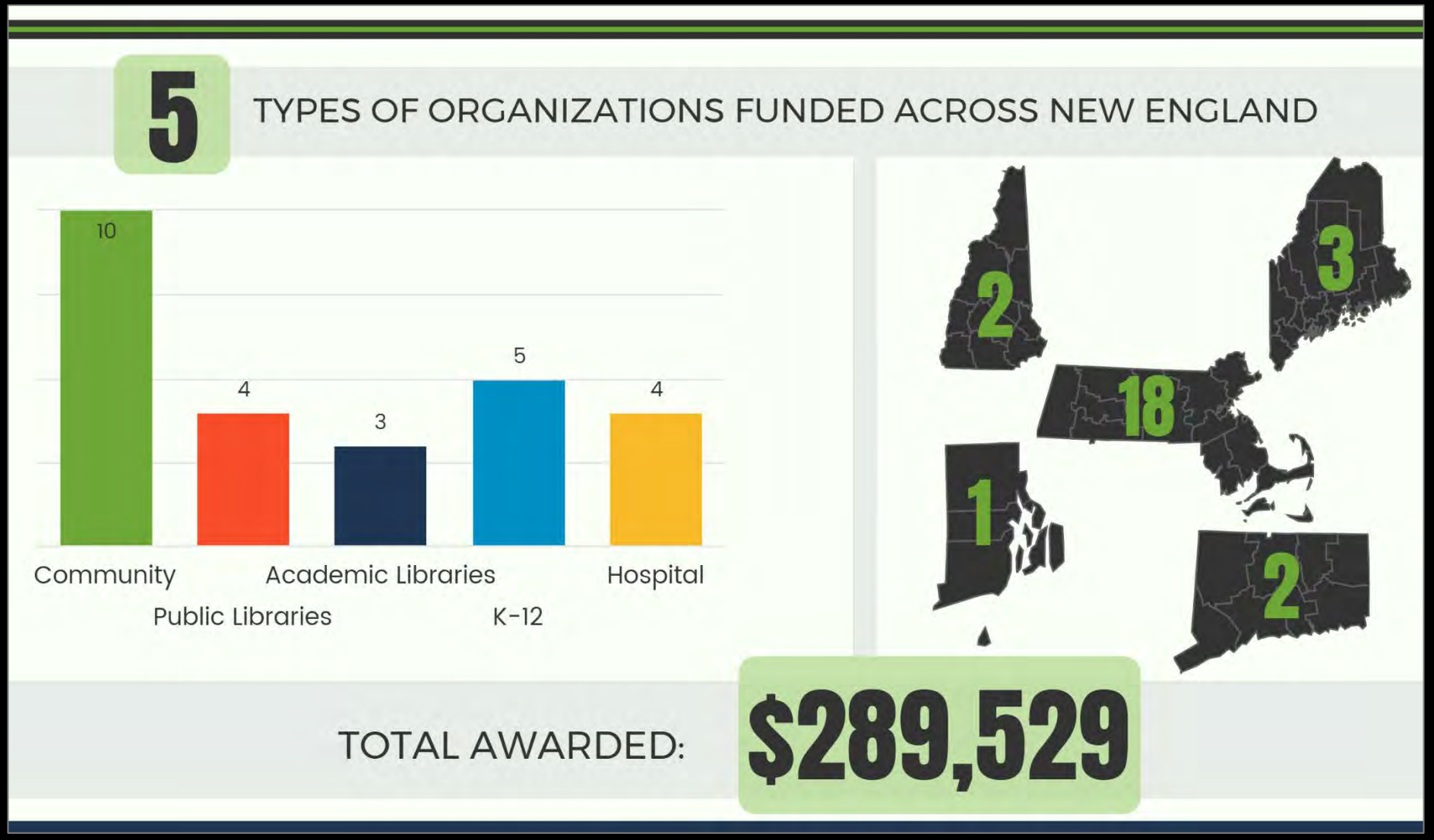
This past year of projects has been amazing, and we thank all of you.
We'd love to share some of our funding data with you.

17 FIRST-TIME AWARDEES
(never received our funding before) !

26 PROJECTS IN THE NEW ENGLAND REGION



NNLM NER Funding



Contact

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NIH NLM NNLM

UMASS University of Massachusetts Medical School

Research

Gasco, J., Patel, A., Ortega-Barnett, J., Branch, D., Desai, S., Kuo, Y. F., ... & Banerjee, P. (2014). Virtual reality spine surgery simulation: an empirical study of its usefulness. *Neurological research*, *36*(11), 968-973.

Johnson, S., & Coxon, M. (2016). Sound can enhance the analgesic effect of virtual reality. *Royal Society open science*, *3*(3), 150567.

Jones, T., Moore, T., & Choo, J. (2016). The Impact of Virtual Reality on Chronic Pain. *PloS one*, *11*(12), e0167523.

UNE UNIVERSITY OF NEW ENGLAND

INNOVATION FOR A HEALTHIER PLANET

We Are Alfred: Empathy Learned Through a Medical Education Virtual Reality Project

Marilyn R. Gugliucci, MA, PhD

Barbara Swartzlander, MSEd, MLS

Elizabeth Dyer, MLIS, AHIP

Introduction

- Those 65 years and older use more than 50% of health care resources.
- As the older population increases and lives longer, their health care utilization is predicted to increase dramatically.
- We have an obligation to train our future health care providers to work with older adults.
- Innovative learning modalities, such as virtual reality, augment medical students' learning about older adult health care.
- We Are Alfred Virtual Reality provides such a platform teaching about Macular Degeneration while instilling empathy.

Learning Objectives

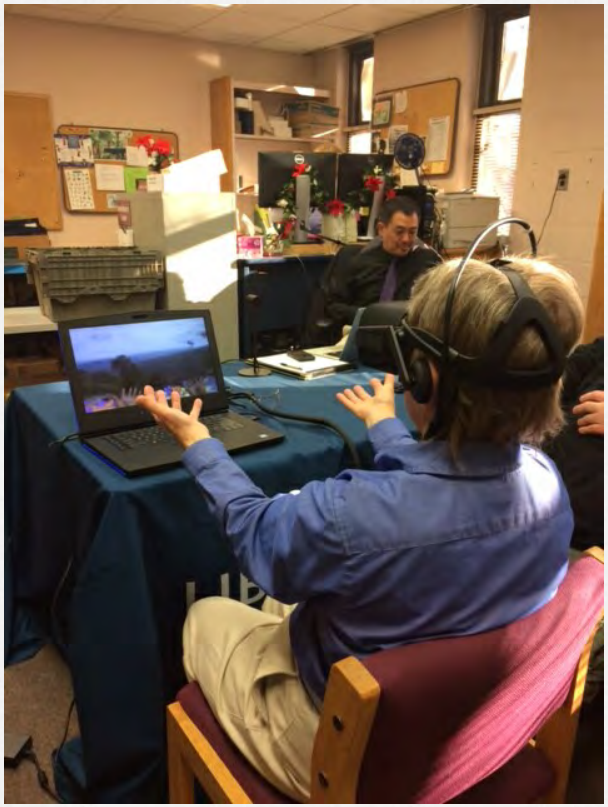
- Participants (Faculty, Medical Students/Health Professions Students) will be able to:
  - Learn how to implement virtual reality education modules in medical and/or health professions education
  - Discuss the role of virtual reality case study immersion as a viable education modality
  - Understand how virtual reality technology can be utilized as a health/medical education tool.

Methods

- First year medical students (N=175) were required to complete the ‘We Are Alfred’ Virtual Reality (VR) module (15 min) and a pre/post test.
  - 51% Female / 49% Male
  - Average age: 25.4
  - Age range: 21 - 44
  - 63% from New England
- Four computer stations were constructed at the university library in which the students had 24/7 access.
- The students assumed the role of Alfred, a 74 y/o African American male with macular degeneration and hearing loss.
- “We Are Alfred" utilizes a virtual reality headset, headphones, and a hand-tracking device to immerse students into Alfred’s experiences as a patient.
- Descriptive statistics and t-tests were applied for data analyses.
- Funding for the project: National Network of Libraries of Medicine New England Region (NN/LM NER) Technology Grant

What is Macular Degeneration?

Results



- Learning was broad and significant…
- 94% reported increased empathy
- 92% reported increased learning about macular degeneration
- 90% reported increased learning about hearing loss.

Results

What words come to mind when you hear "older people or aging?

Pre Test Adjectives

- Slow
- Elderly
- Frail
- Illness
- Death

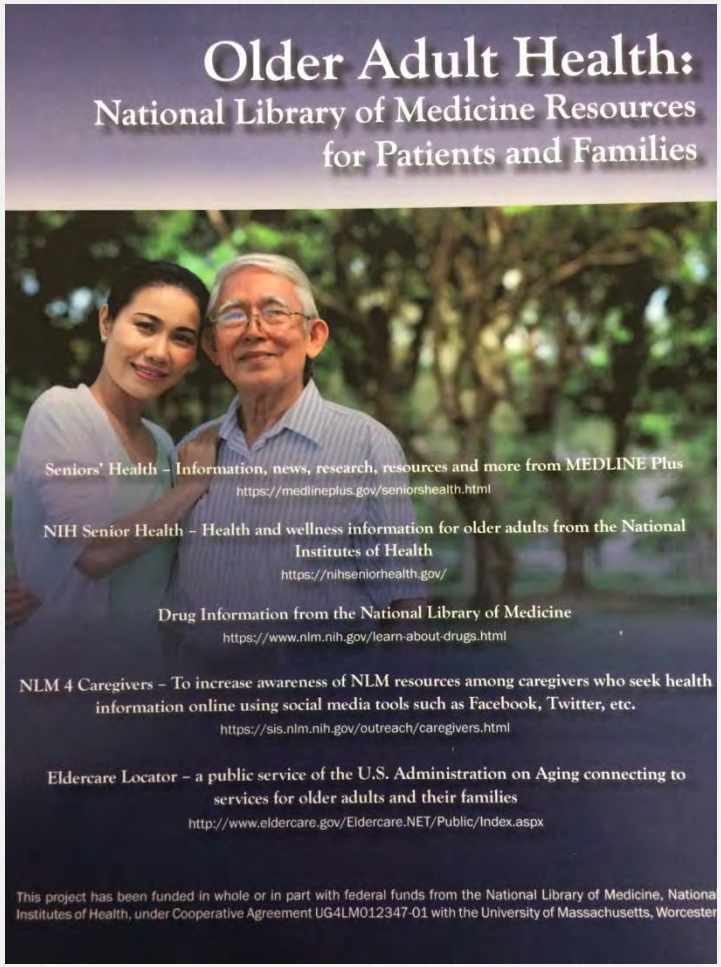
Post Test Adjectives

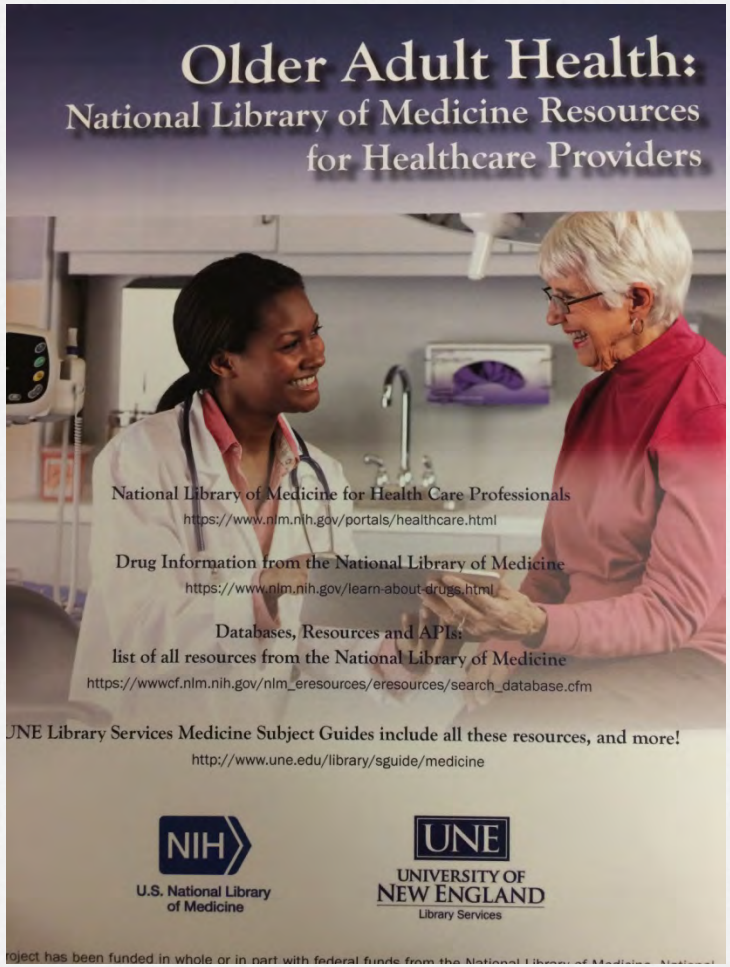
- Misunderstood
- Complicated
- Misunderstood
- Frustration
- Can't generalize what aging means for everyone

Students' Representative Comments

- *This was definitely a unique experience - I had no idea that sensory deficits of this proportion were actually fairly common in the aging population, and it has really opened my eyes to what elder individuals may be going through.*
- *This experience was truly eye-opening and I thoroughly enjoyed it*
- *We're all, for the most part, healthy and capable 20 somethings with no sense of what it means to have macular degeneration or any other type of serious degenerative illness. I don't think this experience necessarily gives us the perfect foundation but what could? It's a great first step!*
- *I loved this experience because I think it's an incredible step forward to incorporating technology into our curriculum and creating a fundamental understanding of some of the symptoms our patients may be experiencing.*

Resources


Older Adult Health:
National Library of Medicine Resources
for Patients and Families
Seniors' Health – Information, news, research, resources and more from MEDLINE Plus
https://medlineplus.gov/seniorshealth.html
NIH Senior Health – Health and wellness information for older adults from the National Institutes of Health
https://nihseniorhealth.gov/
Drug Information from the National Library of Medicine
https://www.nlm.nih.gov/learn-about-drugs.html
NLM 4 Caregivers – To increase awareness of NLM resources among caregivers who seek health information online using social media tools such as Facebook, Twitter, etc.
https://sis.nlm.nih.gov/outreach/caregivers.html
Eldercare Locator – a public service of the U.S. Administration on Aging connecting to services for older adults and their families
http://www.eldercare.gov/Eldercare.NET/Public/Index.aspx
This project has been funded in whole or in part with federal funds from the National Library of Medicine, National
Institutes of Health, under Cooperative Agreement UG4LM012347-01 with the University of Massachusetts, Worcester


Older Adult Health:
National Library of Medicine Resources
for Healthcare Providers
National Library of Medicine for Health Care Professionals
https://www.nlm.nih.gov/portals/healthcare.html
Drug Information from the National Library of Medicine
https://www.nlm.nih.gov/learn-about-drugs.html
Databases, Resources and APIs:
list of all resources from the National Library of Medicine
https://wwwcf.nlm.nih.gov/nlm_eresources/eresources/search_database.cfm
UNE Library Services Medicine Subject Guides include all these resources, and more!
http://www.une.edu/library/sguide/medicine
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Library Services

Conclusion

- Virtual reality was deemed a successful medical education learning tool for these medical students.
- Utilizing this technology to create an immersive case study taught these medical students about the aging experience from the first-person patient perspective.

Thank you!

Embodied Labs for their creativity in designing this project and their support throughout

UNE IT Staff

Library Staff and Student Workers

National Network of Libraries of Medicine New England Region (NN/LM NER) Technology Grant

Questions & Comments

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